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ABSTRACT

On the premise that the variety of problems plaguing education can be clustered around central themes conducive to attack in a systematic way by educational research and development (R & D) personnel, this paper deals with the scope of management problems, requirements of an R & D management model, and a proposed R & D management system, which includes use of the convergence technique (Careese and Baker), the formulative evaluation plan (Kniefel), and the Evaluation Reporting System (Phillips and Blanton), each of which are briefly explained and summarized. The author concludes that the three systems can be folded into an effective management model for a program of research and development: The convergence technique provides a systematic way of conceptualizing an R & D program, but lacks an adequate component for facilitating information flow; Kniefel's formative evaluation system can be utilized to provide the information component of the convergence model; and the Evaluation Reporting System (which has been adapted to digital computer information processing techniques) provides the necessary technology for mechanizing the model on a large scale. (LAS)

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MANAGING PROGRAMMATIC RESEARCH AND DEVELOPMENT IN EDUCATION

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MANAGING PROGRAMMATIC RESEARCH AND DEVELOPMENT IN EDUCATION

INTRODUCTION

A major premise of this paper is that the variety of problems plaguing education can be clustered around central themes conducive to attack in a systematic way by educational R & D personnel. Solutions to the resulting complex problems are such that they demand programmatic, sustained efforts whose component parts or projects are clearly and logically related to each other and which have a potentially cumulative impact. Educational R & D has for so long experienced too much of the alternative of unrelated, sporadic activities dependent upon the unique interests of institutions or individuals. This practice spreads both talent and funds entirely too thin to lead to visable improvements in the field.

As a result of these experiences a definite need for continuity and stability in the educational R & D environment as well as the need for larger scale efforts has become more apparent. Individual R & D efforts are by necessity limited to the capabilities and resources of an individual or institution and rarely lead to the solutions needed for contemporary problems. In addition, the various efforts are typically unrelated. Thus, although a project or activity may be successful in itself, it neither effectively utilizes the results of previous activities nor does it result in a base upon which other activities may build.

An effective R & D model requires continuity and additivity. R & D goals and priorities must have sufficient clarity and stability to stimulate valid research efforts and insure that activities are completed, replicated, and

utilized as components of a larger scale R & D effort. Successive R & D activities must build upon the successes and failures of prior activities, and the results of activities in progress at the same time should complement and supplement each other as well as being directed at critical problems.

An effective R & D model also plans for and effectively utilizes available R & D competencies. The various R & D competencies such as found in state departments, local units, universities, and other agencies need to complement rather than compete with each other.

The purposes of this paper, then, are threefold. First of all, it will attempt to describe the scope of the R & D management problem faced by the Occupational Research Unit and present a brief picture of our current efforts. Secondly, it will present descriptions of three widly disvergent systems that seem to have application to the problem of R & D management, and thirdly, a proposal for interfacing the three systems into a comprehensive R & D management model will be presented.

It seems appropriate at this time to briefly clarify the meaning of "management" as it is used in this paper. Desmond Cook's definition seems entirely adequate. He defines management as ....

> ...the art and science of planning, organizing, motivating, and controlling human and material resources and their interaction in order to attain a predetermined objective. (3:3)

Cook goes on to explain that management is a broader activity than administration. Whereas management focuses on the broad process of decision-making, administration is more narrowly limited to implementation of policy and the provision of operational support to educational R & D programs.

SCOPE OF THE MANAGEMENT PROBLEM

During late December of 1970 the Occupational Research Unit (ORU) was suddenly and abruptly faced with the onslaught of approximately $700,000 in Federal research monies (and approximately the same amount each year thereafter) which had to be "used" by June 30 of the following year. So, in the spirit of "true-blue" occupational research people - we spend it. It was soon obvious, however, that spending money and managing research aren't necessarily the same thing. The problem of molding approximately twenty-five projects into some semblance of a systematic, related "targeted" R & D program was to say the least, monumental.

Our system of goal setting and prioritizing has ranged all the way from "us" doing it to "them" doing it. Our monitoring activities range from mediocre to ridiculous.

Informational flows among projects and between us and projects is somewhere between non-existent and poor. Our intention of a systematic interrelated program of targeted R & D is but a (attainable) dream.

REQUIREMENTS OF AN R & D MANAGEMENT MODEL

An effective model should serve to help eliminate some of the problems in managing educational R & D. Some of the more troublesome problems faced by the ORU are described below.

Identification of R & D goals. No satisfactory procedure exists for identifying areas requiring concentrated R & D efforts. In the past the ORU has basically relied on a system of compromises between the program managers and the researchers. This method has produced sets of goals lacking continuity

or interrelationships and usually depending, to a large degree, on the current whims of the decision-makers.

Assignment of priorities to R & D goals. The same procedure of compromises is equally unsatisfactory for prioritizing goals. Past products of R & D activities as well as on-going efforts are easy to ignore as priorities are set. This system also leaves itself wide open for insertion of unwanted and irrelevant R & D activities. A system with the capability of identifying what not to do is just as important as one which describes what to do.

Assignment of R & D activities to time frames. An unreal assumption is that R & D activities should have beginning and/or ending dates corresponding to the fiscal year. In the case of the ORU there is undue pressure to commit all research funds as soon as possible without regard to "stacking" projects or at least waiting to see if products from one project are transportable to the next project.

Monitoring on-going R & D activities. Two levels of monitoring are involved in this problem. The first level involves the lack of information flow for the purposes of facilitating administrative decision-making. The second level involves the lack of an informational flow for public relations and/or preliminary dissemination efforts.

THE PROPOSED R & D MANAGEMENT SYSTEM

The preceeding discussion described the major gaps existing in the R & D management system of the ORU. The following discussion will present brief capsules of systems developed by Carrese and Baker, Kniefel, and Phillips and Blanton and describe how these three systems may be "folded" into a workable management system for educational R & D.

The Convergence Technique (Careese and Baker)

The convergence technique was designed to produce a flexible planning system for research. It was first used in medical research but has since been applied to educational R & D (Carrese and Baker, 1967; Gephart, 1970; Nelson, 1972; Carrese, 1972; Moss, 1972). The convergence technique was developed as an alternative to time-event planning systems such as critical path analysis and PERT. There are four major assumptions made in the use of network techniques in non-research efforts which cannot be made in planning research. According to Carrese they are as follows:

1. All tasks or activities needed to achieve program objectives can be determined with a high degree of confidence.
2. All tasks required to achieve objectives are accomplishable, given certain magnitudes of effort.
3. Usuable estimates can be made for the duration of each task and time-targets established.
4. Successful accomplishment of each task in the established network order results in a "positive" benefit to the program (i.e., the program moves forward toward objectives); and successful task accomplishment carries with it the assurance that the objectives of the task are actually achieved. (1:34)

This is not meant to imply that network analysis techniques have no application to R & D activities. They are very useful in planning the events required to complete specific portions of a larger research activity.

Three general criteria were utilized in developing the convergence technique: (1) a logic inherent to the substitive area to be studied must be the basis for planning the general R & D program, the sub-programs and the specific activities encompassed in it; (2) since every event in research cannot be known beforehand, allowances for this tentativeness are necessary; and (3) time specifications for R & D activities must take into account the fact that research ofter cannot

be scheduled to specific deadlines (8:3). The convergence technique is a process for identifying the components of an R & D program and arranging them in a series of planning units which move from general to very specific. The result is a matrix which represents a coordinated series of projects and activities which are identified with the information and resource requirements needed to initiate and carry them out.

Figure 1 presents an example of the convergence matrix in outline form. The matrix has been partially completed to illustrate each of the components of the plan and to define the linear research array. Figure 1 depicts the three major flows of coordinated activities in a convergence plan: (1) research, (2) information, and (3) resources. In this example the goal was the development of teaching competency tests. The data needed to assess the progress of individual projects to determine the overlaps and gaps in research activities, and manage the overall research program are provided by the information flow. The resource flow identifies the personnel, materials, equipment and facilities, and costs associated with each step.

Within the research flow are three separate sub-flows of research activities: (1) linear array, (2) concurrent array, and (3) supplementary array. The linear array defines the main research efforts which are critical to achieving the goal of the total R & D program. In the example given in Figure 1, the linear array contains the objectives for research activities essential to the development of the competency tests. The linear array is further sub-divided in hierarchical order into phases, steps, and projects. Each phase defines a broad area of research related to the overall program goals. The order of the phases provides a logical sequence of activities and is based upon the general research logic

Figure 1. Partial Convergence Plan For The Development of Teaching Competency Tests (8:4)

		PHASE I: IDENTIFY CONSTRUCTS TO BE MEASURED			PHASE II DEVELOP TESTS	PHASE III VALIDATE TESTS
		STEP 1: Conceptualize Role of Teacher	STEP 2: Perform Task Analysis	STEP 3: Isolate Critical Variables		
RESEARCH FLOW	LINEAR ARRAY	*Identify Teacher's Role in Facilitating Learning*	*Identify Tasks and Criterion Levels of Performance*	*Determine and Define Operationally Factors That Influence Teaching Performance*		
	CONCURRENT ARRAY	*Define a Theory of Teaching*	*Develop Improved Task Analysis Procedures*			
	SUPPLEMENTARY ARRAY	*Develop new Statistics for Analyzing Task Analysas Data.*		*Develop new Procedures for Determining Concurrent Validity.*		
INFORMATION FLOW						
RESOURCE FLOW	Personnel					
	Materials					
	Equipment					
	Cost					

involved in test development. Within each phase more specific areas of research are defined and identified as steps. Further definition of research activities takes place through the identification of research projects within each step.

The basic utility of the convergence technique is to focus R & D activities on the end goal(s) of a specific research program. The process of developing a convergence plan, however, moves from these general goals to somewhat more homogeneous groupings of research activities, called phases, into steps which are even more specifically defined areas of research activity. The process is one of differentiating the research activities required to attain the goals of a research program into more specific objectives through the use of phases, steps and projects which are logically sequenced and hierarchically ordered on the basis of research logic associated with the discipline investigated. By using this process the research manager is able to logically define and plan specific research projects which are related to larger program goals. The use of phases, steps and projects organizes the information in the research plan in a manner which does not exceed the information processing capabilities of the human mind. Application of the convergence technique provides relatively few phases to be interrelated and compared. Within the phases the researcher can interrelate the steps. And finally, within a step a set of projects undertaken to attain a common goal can be more easily correlated than in a situation where many research projects might be on-going and somewhat loosely related to the overall goal established for the convergence plan.

Activities that are not considered critical to the achievement of the goals of the total R & D program are listed in the concurrent and supplementary arrays.

However, if time and resources permit, successful completion of these projects will produce valuable inputs for the linear array. Since the linear array is basic to the research program, its sequence and structure directs the sequence of activities in the concurrent array. Projects in the supplementary array entail longer-term and higher-risk activities than those in the concurrent array which are more directly correlated with projects in the linear array.

When a convergence plan is designed no consideration is given to existing research findings or projects underway. After the plan has been logically structured, existing research studies are identified and noted on the plan. It is very possible that a step or phase may require little if any additional research if the step can be accomplished by utilizing the result of prior studies.

After the research arrays have been developed, the information flow can be designed. The function of the information flow is to provide information for the management of the overall research program, major decisions that must be made in relation to the progress of research activities, and interchange of ideas between researchers working on related projects.

Herein, lies the problem with the convergence technique - the information flow is completely insufficient for affecting programmatic change. The following system by Kniefel should serve to fill this shortcoming of the model.

A Formative Evaluation Plan (Kniefel)

The intriguing aspect of the application of Kniefel's plan for formative evaluation to the problem of providing an adequate informational flow is that the plan was developed as a means of evaluation - not with the primary intention of managing R & D activities. However, the process of formative evaluation is almost inseparatable from that of research monitoring. In fact, Kniefel's definition

of formative evaluation is so strongly spiced with implications of information flow that it could just as easily define the process of research monitoring. She states:

> Formative evaluation is the process of providing information at intervals in the project's progress so that additions, deletions, or modifications can be made to maximize project success. (6:6)

Kniefel's formative evaluation plan requires the manager of each activity to first of all list specific objectives and the accompanying strategies as well as the tasks deemed critical to the accomplishment of the strategies. The person(s) responsible for each activity and the duration of each activity is also listed. This information provides a concise description of the entire project which can be used as either a management, evaluation, or monitoring device. Kniefel identifies the following factors as information relative to project success:

1. Is the project operating on schedule?
2. Are the available resources (personnel, facilities, finances, etc.) adequate for project operation?
3. What activities are creating problems in the operation of the project?
4. What activities can be easily assimilated into similar and/or regular school programs.
5. Is the project progressing toward the achievement of its objectives?
6. What activities should be added, deleted, or modified to increase the effectiveness of the project? (6:8)

A "strategy evaluation checklist" is used to provide the necessary information concerning accomplishment of project objectives. The checklist is completed by project directors as each strategy is completed and is forwarded to program monitors on a regular basis.

The strategy evaluation checklist is a simple one page long (both sides) instrument containing the following eight questions:

1. Was the strategy completed in the scheduled time?
2. Were the personnel, facilities, materials and financial resources adequate for the achievement of the strategy?
3. Were there any problems associated with the tasks needed to carry out the strategy?
4. Were any activities successful to the extent that they could be assimilated into a similar program and/or a regular educational program?
5. Did the strategy appear to accomplish its mission as a step toward the achievement of the objective?
6. Are any changes necessary in future objectives, strategies, or tasks?
7. Would you recommend this strategy to other projects considering similar objectives?
8. Approximately how many man-days were involved in the achievement of the strategy? (5)

The beauty of Kniefel's formative evaluation system is that it's so simple it works. Initial try-outs indicate it is a workable way of facilitating information flow both between individual projects and between projects and funding agencies.

The Evaluation Reporting System (Phillips and Blanton)

Phillips and Blanton have developed a highly sophisticated technique for management of R & D activities called the Evaluation Reporting System (ERS). The primary management control procedure used is based on the concept of variance reporting. Variance reporting is the analysis of the deviations in actual budgets and schedules from what was originally projected.

The ERS is a set or procedures and forms that serve to generate, collect and process programmatic information. The important point as far as this paper

is concerned is not the forms or procedures of the system but the fact that the system has been adapted to digital computer information processing techniques. As the flow of information as well as informational demands multiply, mechanization of any reporting system will become a necessity.

CONCLUSIONS

The three systems discussed in this paper can be folded into a effective management model for a program of research and development. The convergence technique provides a systematic way of conceptualizing an R & D program but lacks an adequate component for facilitating information flow. Kniefel's formative evaluation system can be utilized to provide the information component of the convergence model. The Evaluation Reporting System provides the necessary technology for mechanizing the model on a large scale.

The purpose of any model is not to "do" anything, but, to provide a logical basis for conceptualizing the problem. And, the first phase of solving any problem is to develop a plan for doing just that - this paper is that plan.

Mark Twain probably had the idea years ago. Sydney Harris of the Chicago Daily News tells the story that Twain was once asked -- this must have been in 1910 or 1911 -- what he would do, if he were Secretary of the Navy, about the submarine menance. Twain promptly replied, "I would boil the ocean." "But Mr. Twain, how would you boil the ocean?" The venerable sage replied, "That's a mere administrative detail. Don't bother me with trivia when I've done the heavy thinking." (11:14)

The heavy thinkers have provided us with the models. Now it's up to us to work out the nasty administrative details.

REFERENCES

1. Carrese, Louis M. "The Convergence Technique: An Alternative Strategy For Programmatic Research and Development", Programmatic Research And Development In Education, Research and Development Series 70, The Center For Vocational And Technical Education, The Ohio State University, Edited by Frank C. Pratzner and Jerry P. Walker, 1972.

2. Carrese, L. M. and Baker, C. G. "The Convergence Technique: A Method For The Planning And Programming Of Research Efforts", Management Science, Vol. 13, No. 8, April, 1967.

3. Cook, Desmond L. Program Evaluation and Review Technique, Cooperative Research Monograph No. 17, U. S. Department of Health, Education, and Welfare, Office of Education, 1966.

4. Gephart, W. J. Application Of The Convergence Technique To Basic Studies Of The Reading Process, Final Report to Phi Delta Kappa, Bloomington, Indiana, 1970.

5. Kniefel, Tanya M. "A Handbook For Planning The Project SEED Evaluation", N. C. State Department of Public Instruction, Raleigh, No Date.

6. Kniefel, Tanya M. "A Formative - Summative Evaluation Design For A State-Sponsored Program Of Educational Experimentation", Paper presented at AERA, New Orleans, La., N. C. Department of Public Instruction, Raleigh, 1973.

7. Moss, Jerome, Jr. "Managed Research In Vocational Education", Programmatic Research And Development In Education, Research And Development Series 70, The Center For Vocational And Technical Education, The Ohio State University, Edited by Frank C. Pratzner and Jerry P. Walker, 1972.

8. Nelson, Orville "An Application Of The Convergence Technique To Vocational Education Research", Center For Vocational, Technical, And Adult Education, University of Wisconsin, Menomonie, 1972.

9. Phillips, Dennis M. and Blanton, Larry J. A Planning And Accountability Management System For Educational Research (Draft), National Center For Occupational Education, Raleigh, No Date.

10. Smith, Brandon B. and Thomas, Roy A. "Planning And Evaluating Developmental Projects In Career Education", Minnesota Research Coordinating Unit For Vocational Education, Minneapolis, No Date.

11. Elam, Stanley "What Is The State Of The Art", Paper presented at the Southeastern United States Symposium on Competency-Based Teacher Education, Asheville, North Carolina, April, 1973.